Missed Women: Causes and Consequences of Gender Differences in the Treatment of Heart Disease

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February 13, 2026

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1 Introduction

Gender differences in health are a widely recognized phenomenon (World Economic Forum, 2024; Cabral and Dillender, 2021), yet our understanding of the underlying causes is limited. This paper focuses on ischaemic heart disease, which is not only the leading cause of death worldwide (WHO, 2020) but also a condition characterized by significant gender inequality. While men are overall more likely to be diagnosed with ischaemic heart disease (7%) compared to women (5%) (Mozaffarian et al., 2015), women experience significantly higher mortality rates after acute events such as acute myocardial infarction (AMI).[1] This is puzzling: those who are sicker (and thus more likely to die from AMI) should be more likely to be diagnosed in the first place. While this pattern is well recognized in the medical literature, there is no universal explanation to this. On the contrary, there have been calls for action to achieve better outcomes for women with heart disease by, e.g., the European Atherosclerosis Society (Roeters van Lennep et al., 2023). While we care about the large gender gap in mortality, this pattern also suggests that there are large health disparities before the AMI, in line with (World Economic Forum, 2024) finding that women spend 25% more of their life in debilitating health. Such large health disparities also likely spill over to the labor market - contributing to gender inequality on the labor market.

There is a multitude of potential reasons behind higher post-AMI mortality for women despite lower diagnosis prevalence: The medical literature has debated if potential explanations could be found in gender differences in the disease process (pathophysiology[2]), in symptom presentation, care-seeking, or care provision (Aggarwal et al., 2018; Mehta et al., 2016; Greenwood et al., 2018). Some studies point to the importance of patient choices in terms of care-seeking and health behaviors rooted in demographics (Bairey Merz, 2014; Hanratty et al., 2000; Karcioğlu et al., 2002). Other studies argue that provider behavior plays a role, arguing that women are often underdiagnosed and thus do not receive the necessary preventive care, e.g., in the form of medication (Roeters van Lennep et al., 2023; Wenger, 2012). This claim, however, lacks causal evidence.

This paper investigates the underlying causes of higher female mortality post-AMI despite lower diagnosed prevalence. Using a unique combination of high-quality Danish administrative register data with medical examination data, we start by showing that a large portion of the mortality gap is driven by lower previous treatment with lipid-lowering drugs - a highly effective and well-established treatment for high cholesterol, and a key contributor to heart disease. Differences in treatment levels can be driven by differences in care usage

[1] This finding holds across many countries even when accounting for the fact that AMIs occur on average later for women than for men (Emanuel et al., 2021; Greenwood et al., 2018; Mehta et al., 2016) and despite general advances in survival following cardiovascular disease events.

[2] Pathophysiology studies "biological processes that are directly related to disease processes of physical, mental, or psychophysiological conditions and disorders" (Witthöft, 2013). This could, for example, mean that women experience stronger AMIs than men.

or in the provision of care. Using data from medical examinations, including cholesterol measurements, we demonstrate that GPs largely comply with medical guidelines - there is no gender gap in treatment with lipid-lowering drugs if we take eligible patients according to relevant guidelines into account. This suggests that potential physician bias in primary care is not driving treatment gaps, but points to an important role of gender differences in medical guidelines. Diagnostic thresholds for receiving treatment for heart disease are substantially higher for women than they are for men. While medically motivated, a part of these gender differences stems from the fact that guidelines are derived from observational data relying on diagnosed heart disease, which likely captures men and women unequally. We elaborate more on this in Section 2.

We then empirically investigate the consequences of gender differences in guidelines - i.e., not meeting diagnostic thresholds just because of gender and not because of health markers. We compare women who, according to female guidelines, meet eligibility criteria for treatment with lipid-lowering drugs to those who were just below the female threshold - but would have been above the male threshold. This enables us to assess the role of gender differences in medical recommendations. If these recommendations are working well, we would expect those women who were just missed to do equally well or better than those who were deemed sick and are eligible for treatment. We, however, show that mortality is substantially higher for those who were just missed by the guidelines in the first 5 years after measurement. The difference in mortality disappears if we control for the usage of lipid-lowering drugs, thus demonstrating a clear pathway of drug treatment. We then investigate whether being missed is also associated with labor market outcomes. We show that those just missed women are less likely to work and more likely to be on diabetes benefits than those who were eligible for treatment. While labor supply differences occur immediately, differences in disability uptake only emerge several years after the measurement.